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(12) **UK Patent Application** (19) **GB** (11) **2 240 583** (13) **A**  
(43) Date of A publication 07.08.1991

(21) Application No 9101053.8

(22) Date of filing 17.01.1991

(30) Priority data

(31) 9001309  
9005743

(32) 19.01.1990  
14.03.1990

(33) GB

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(51) INT CL<sup>8</sup>

E05B 65/12 15/00 15/16

(52) UK CL (Edition K)

E2A AEC AMX APA A100 A106 A118 A135 A143  
A145 A162 A163 A190 A196 A401 A431 A505 A550  
F2K K2A2  
U1S S1855

(56) Documents cited

GB 2233703 A GB 2208240 A DE 1063926 C

(58) Field of search

UK CL (Edition K) E2A AEC APA APX  
INT CL<sup>8</sup> E05B, E05C  
Online databases: WPI

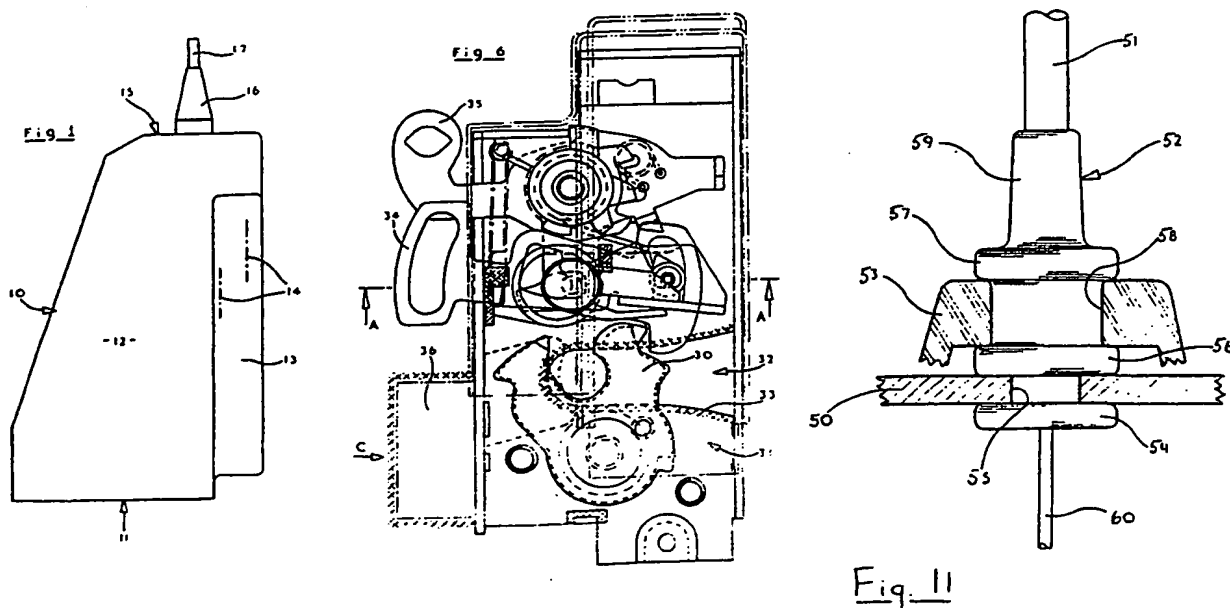
(54) **Motor vehicle door latches**

(57) The latch housing 31 of a motor vehicle door latch having locking and release levers 34, 35 is encased within a boot or sleeve formed as a one-piece moulding of a water-impervious, sound-damping synthetic plastics material, for example, pvc, which is slotted or otherwise apertured to allow the locking and release levers to project for connection to appropriate linkages and to provide access for connection of (a) cable(s), Bowden and/or electric.

In the embodiment of Figures 1-2 the boot or sleeve 10 has a main body portion 12, a wedge-shaped portion 13 with slots through which levers 34, 35 project and a projecting formation 16 which fits over a cable nipple.

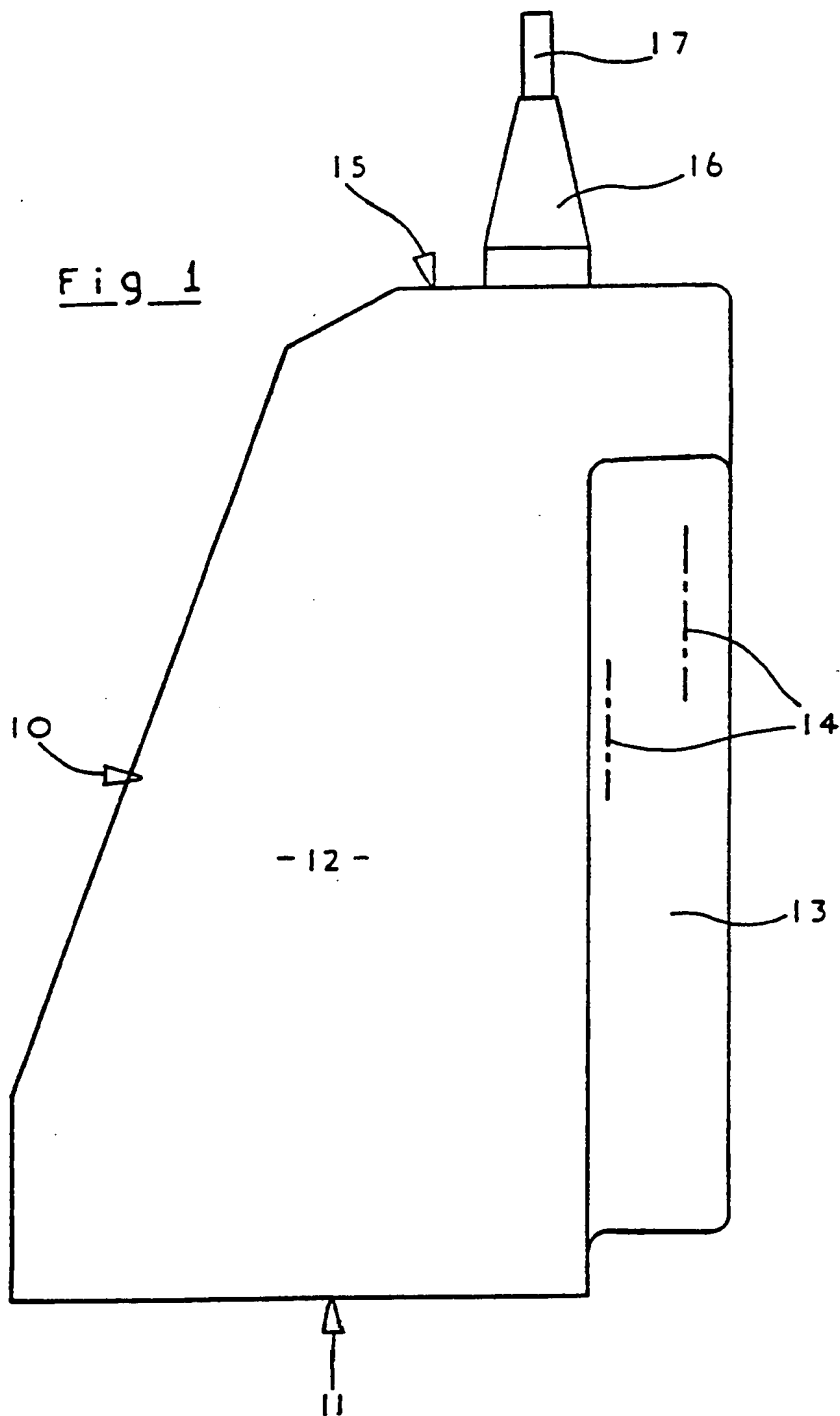
Figures 3-5 show an alternative boot or sleeve (20). Latch may include an electric motor or other actuator. Figure 10 shows reinforcement elements (washers or nuts) around openings in the boot or sleeve through which pass shanks of fixing elements.

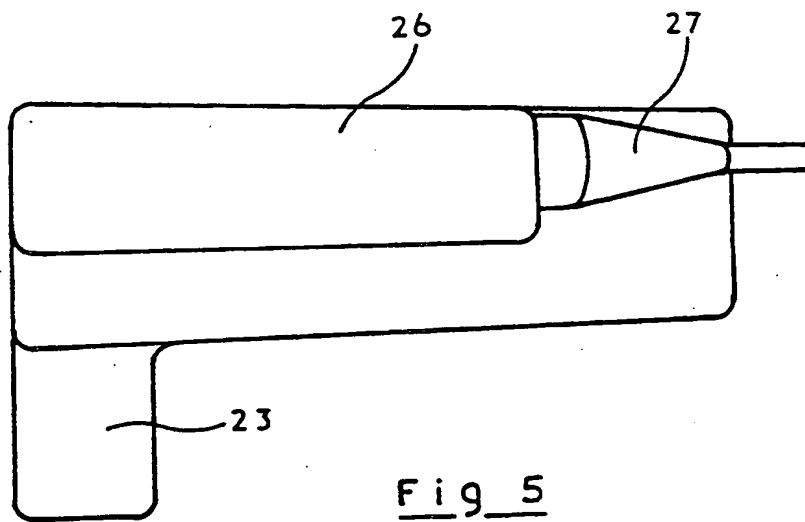
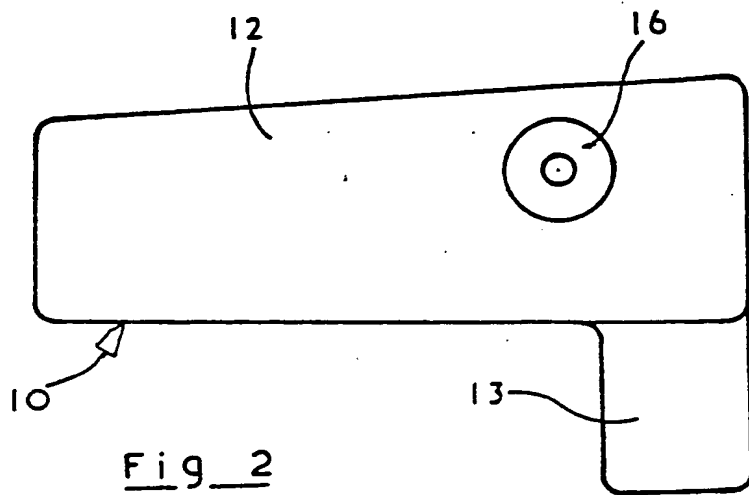
Figure 11 shows details of attachment of outer sheath of Bowden cable to the latch housing.



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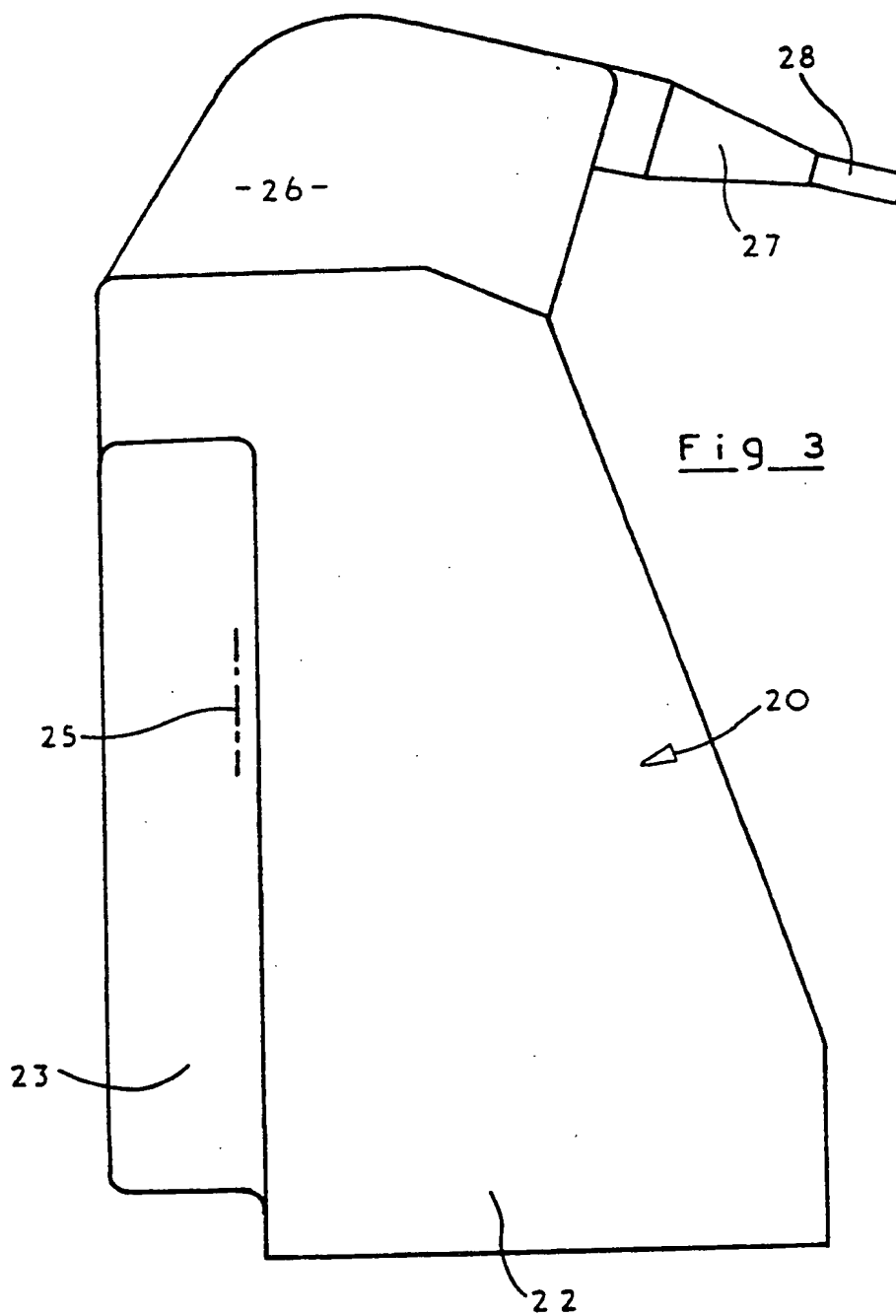


Fig 4

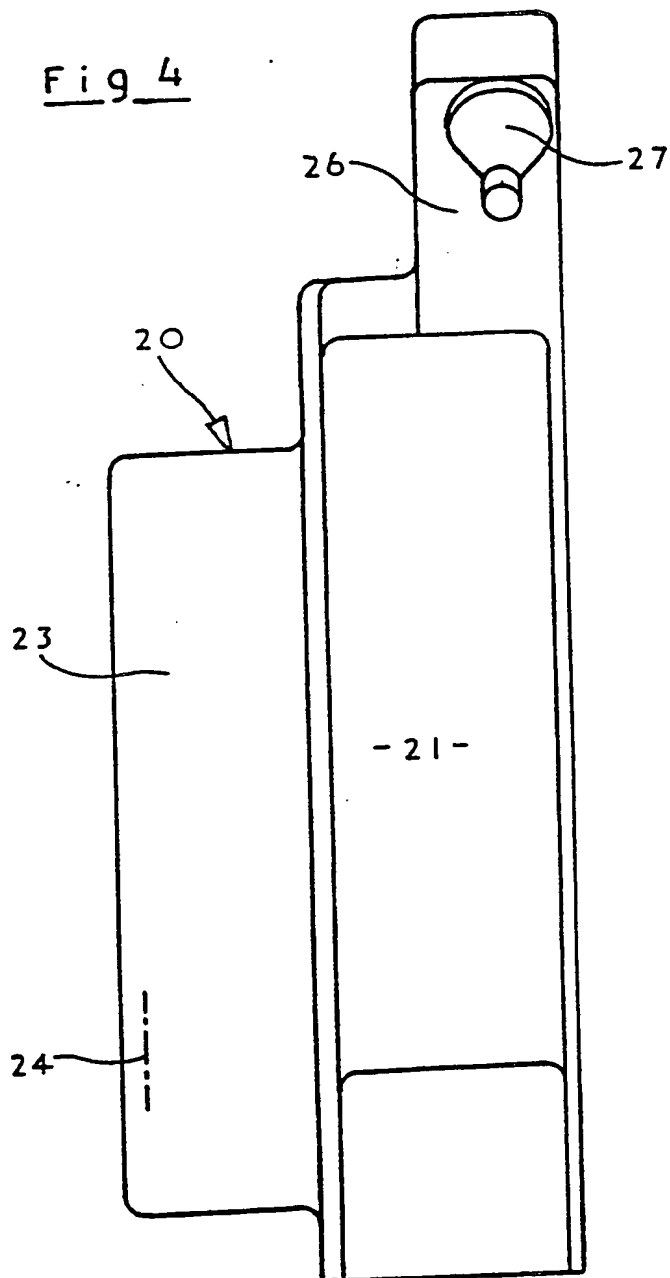
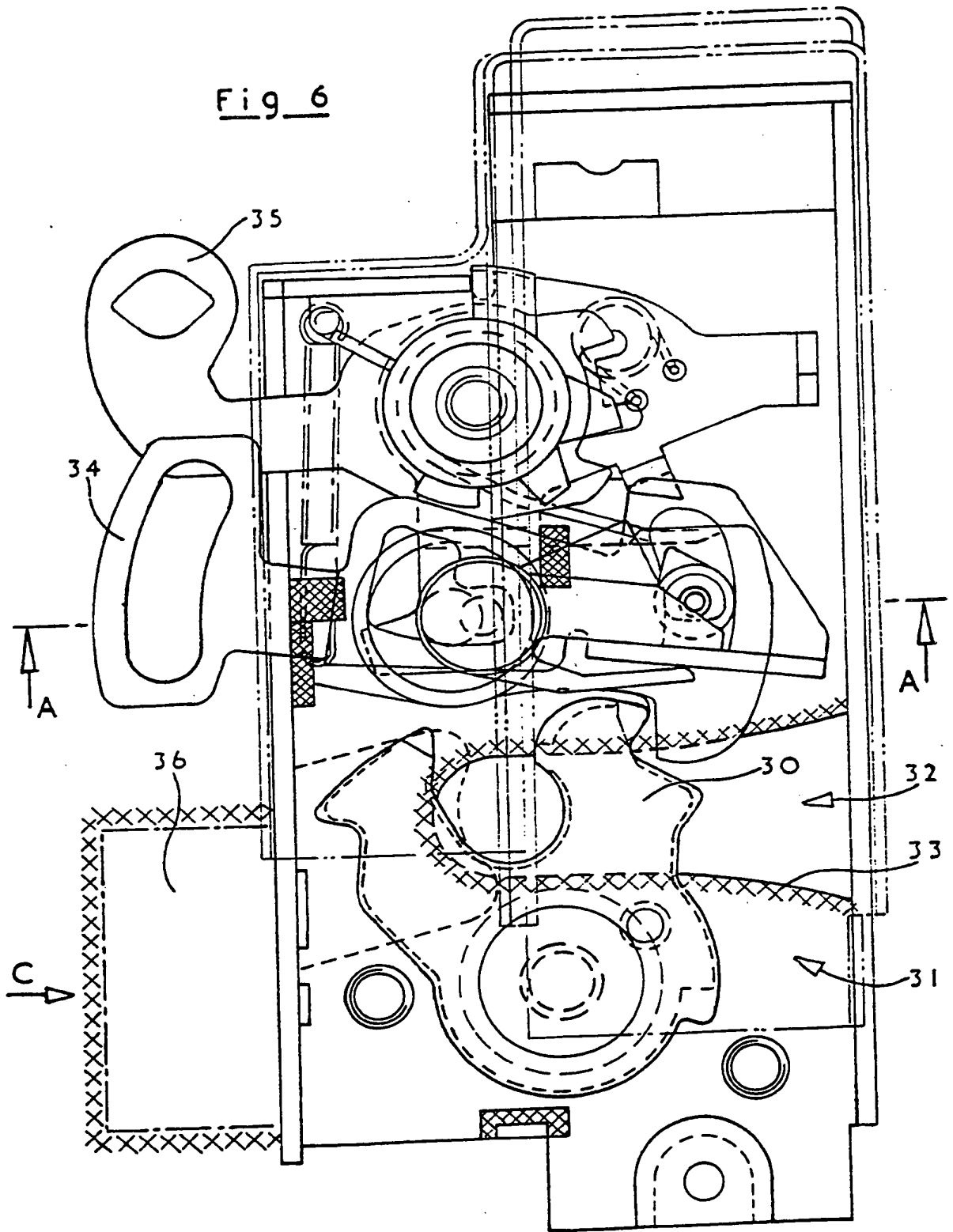
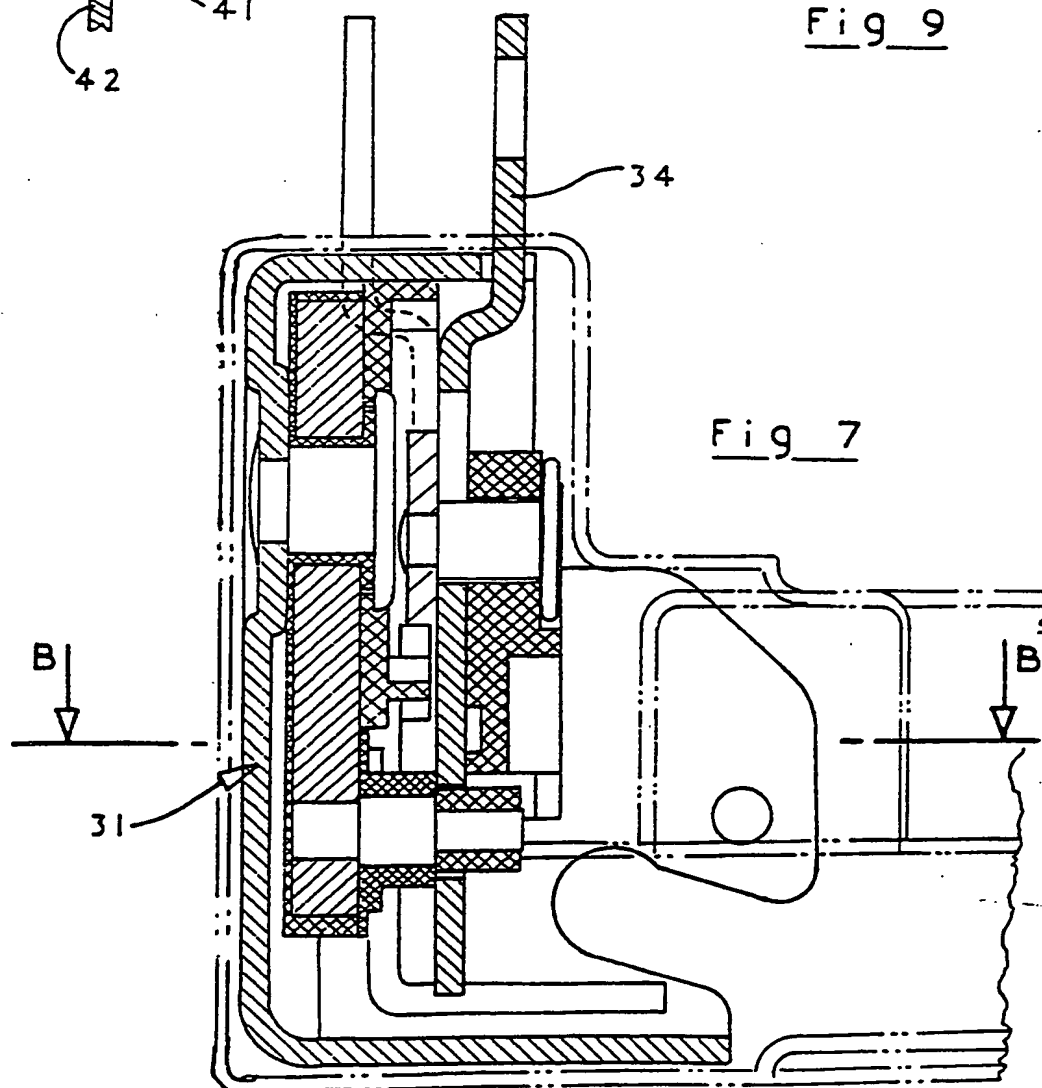
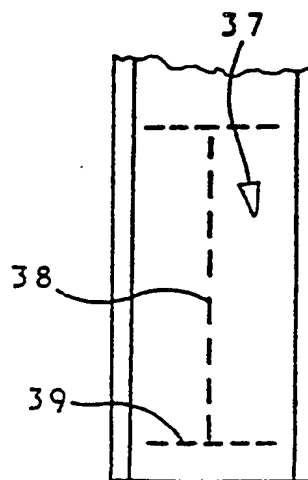
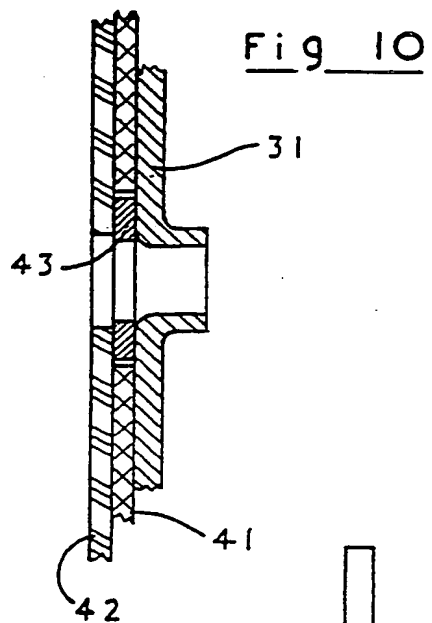
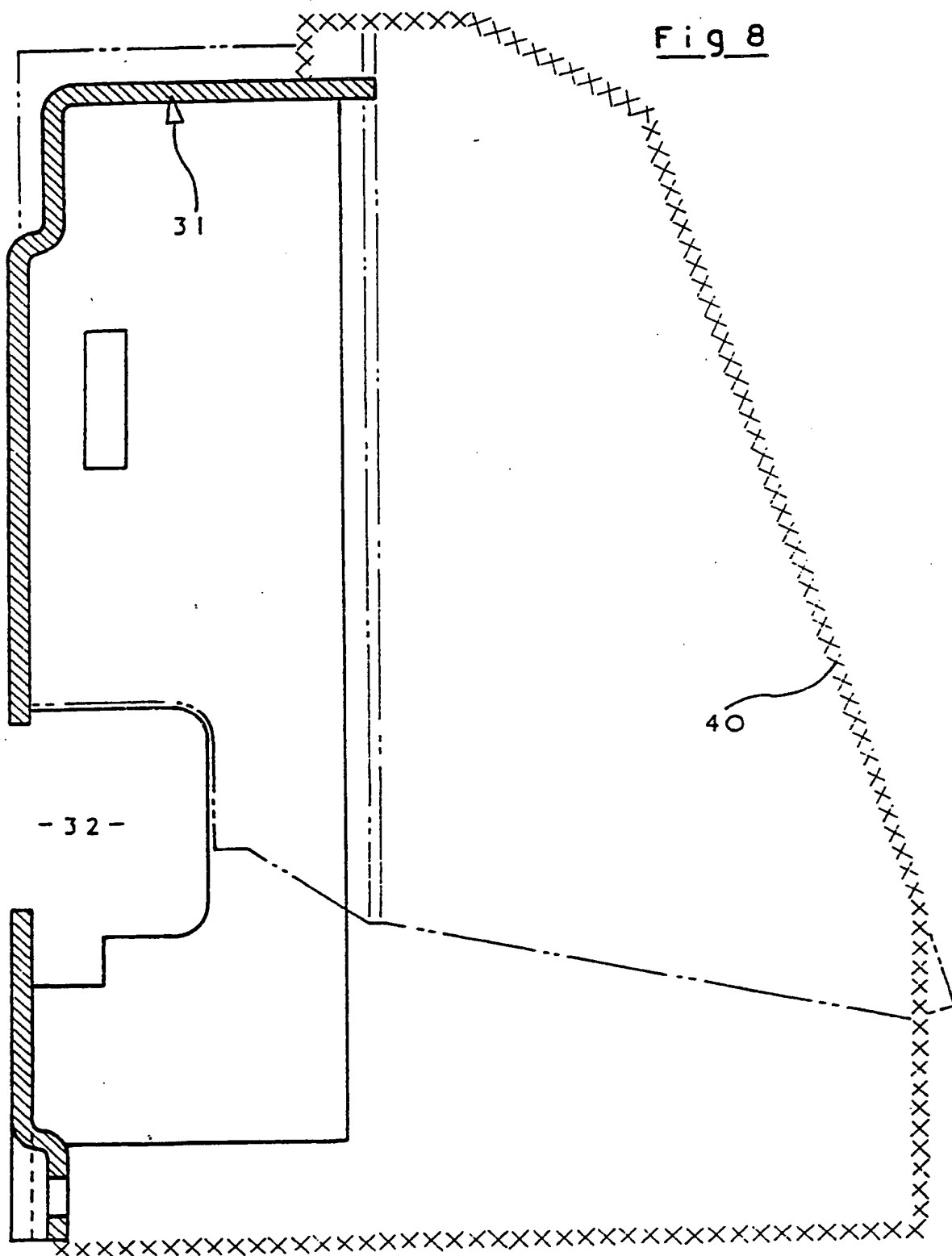


Fig 6



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Fig 8



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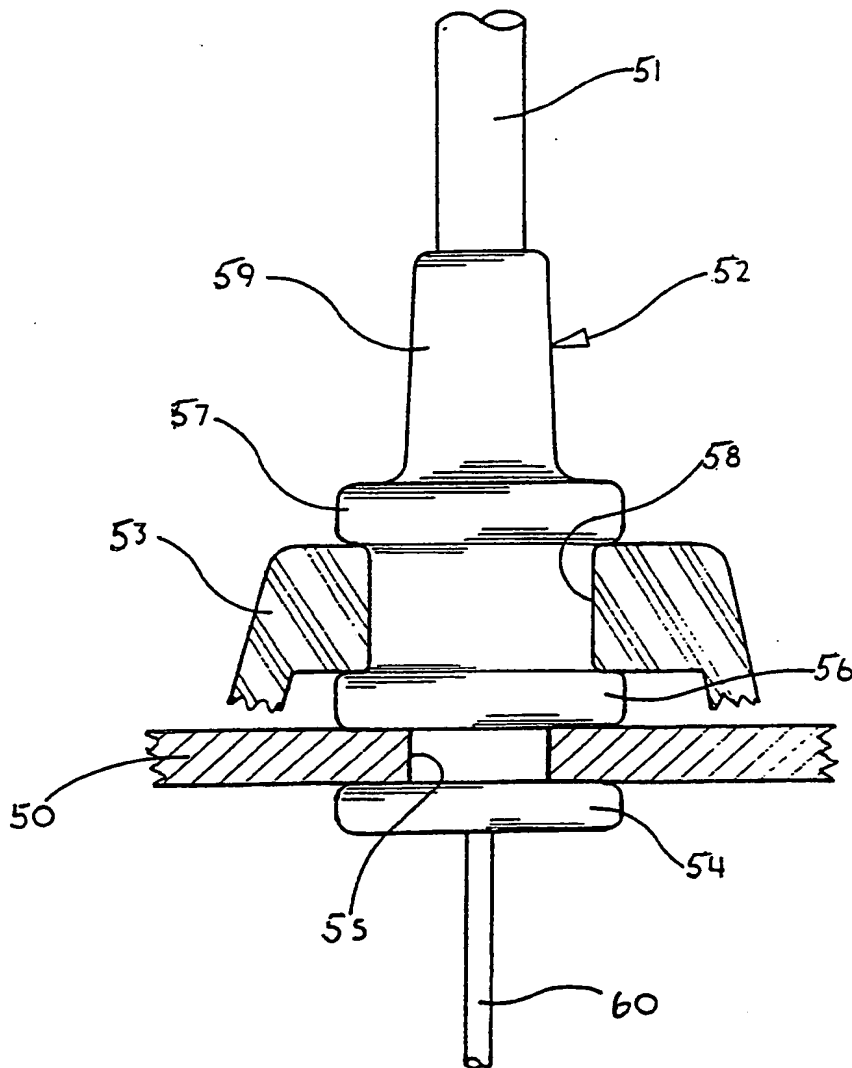


Fig. 11

VEHICLE DOOR LATCHESField of the Invention

This invention relates to door latches for motor vehicles and, more specifically, to means for protecting electrically operated vehicle door latches from corrosion.

Background of the Invention

With the increasing sophistication of electric locking systems for motor vehicles, considerable effort is being directed towards water-proofing the electric motors or other actuators which provide the locking and unlocking action. The motors are being provided, for example, with labyrinthine internal sealing systems.

Despite all the efforts which are being made in this respect, there are still occasional motor failures in adverse weather conditions and it is accordingly an object of the present invention to provide an improved latch design to overcome this problem.

It is appreciated that proposals have previously been made for incorporating protective covers in mechanically operated vehicle door latches, see, for example, British Patent Specification No. 2 208 240. The protective cover described in that specification is, however, a rigid plastics component and would not be suitable for incorporation in an electrically operated latch.

Another arrangement for providing a water-proof cover for a mechanically operated vehicle door latch is shown in German Patent Specification No. 1063926.

#### Summary of the Invention

According to the present invention there is provided a vehicle door latch having a shut face and including locking and release levers, wherein the latch as a whole, apart from the shut face thereof, is encased within a boot or sleeve formed as a one-piece moulding of a flexible, water-impervious, sound-damping synthetic plastics material, which boot or sleeve is slotted or otherwise apertured to provide access for connection

of a cable and to allow the locking and release levers to project so that linkages can be connected to the levers.

The cable may be an electric cable for the supply of actuating current to an electric actuator mounted on the latch and encased within the boot or sleeve. Alternatively, the cable may be a Bowden cable. There may, however, not only be an electric cable for supplying current to an electric actuator but also a Bowden cable for operating the locking and release levers.

The latch preferably includes a base plate formed with an open mouth to receive the latch striker for engagement with the latch bolt. The latch in such case may be generally as described in either of our co-pending Applications Nos. 2 226 076 and 2 228 524 to which reference should be made, the walls of the boot or sleeve being formed with channels to permit free movement of the striker into engagement with the latch bolt.

The boot or sleeve may be formed of a relatively soft plastics material, for example polyvinylchloride containing a high proportion of an appropriate plasticiser to obtain the required characteristics of flexibility, elasticity and sound-damping. By forming the boot or sleeve as a one-piece moulding of a flexible, elastic material as opposed to a rigid plastics material, fitment of the boot or sleeve to the latch in such

manner as to ensure the required degree of waterproofness is thereby assured.

The boot or sleeve may be provided with a plurality of inserts which act as reinforcement elements around openings in the boot or sleeve through which pass the shanks of fixing elements used for attaching the latch housing to the vehicle door panel. The reinforcement elements may be in the form of washers or clinch nuts.

As mentioned above, the cable may be a Bowden cable the outer sheath of which is attached to the latch housing by an end formation which has a pair of spaced cylindrical bearing surfaces separated by a shoulder, said spaced cylindrical bearing surfaces comprising a first bearing surface which fits within an opening in the latch housing to anchor said end formation and a second bearing surface which fits within the aperture in the boot or sleeve and has a diameter greater than that of the first bearing surface.

The end formation of the outer sheath of the Bowden cable is preferably provided with an end flange and with two ribs or shoulders of the same diameter as the end flange, the first bearing surface being located between the end flange and the first of the two ribs or shoulders while the second bearing surface, which has an axial length equal to the thickness of

the adjacent portion of the boot or sleeve, is located between the two ribs or shoulders.

An improved sealing arrangement is thus provided which enables the end formation of the outer sheath to be passed through the aperture in the boot or sleeve without excessive stretching of the plastics material of which the boot or sleeve is formed.

#### Brief Description of the Drawings

Figure 1 is a side view of a first form of boot or sleeve designed to act as a water-shield for a motor vehicle door latch,

Figure 2 is an end view of the boot or sleeve shown in Figure 1,

Figure 3 is a side view of a second form of door latch boot or sleeve,

Figure 4 is an underneath plan view of the boot or sleeve shown in Figure 3,

Figure 5 is an end view of the boot or sleeve shown in Figure 3,

Figure 6 shows a door latch to which the boot or sleeve of Figures 1 and 2 can be fitted, certain parts of the boot or sleeve being shown hatched in Figure 6,

Figure 7 is a sectional view of the door latch along the line A-A of Figure 6,

Figure 8 is a sectional view of the door latch along the line B-B of Figure 7,

Figure 9 shows part of the boot or sleeve as viewed in the direction of the arrow C in Figure 6,

Figure 10 is a detail view showing the method of attachment of the latch housing to the vehicle door panel, and

Figure 11 is a further detail view showing the method of attachment of the outer sheath of the Bowden cable operating mechanism to the latch housing.

#### Description of the Preferred Embodiments

The boot or sleeve 10 shown in Figures 1 and 2 is formed of a soft, flexible, elastically deformable synthetic plastics material, for example, polyvinylchloride containing a high proportion of a plasticiser. The boot or sleeve 10 is intended

to be used as a water-shield for an electrically-actuated, cable-operated latch, the general latch design being, for example, as described in European Patent Application No. 0169644, but with the addition of an electric motor for effecting electric locking and unlocking of the latch.

The boot or sleeve 10 is formed as a one-piece moulding so that there are no joints which constitute areas of weakness and so that the whole of the latch, apart from the shut face thereof, is covered by the boot or sleeve 10 which is accordingly continuous apart from an opening on that face thereof indicated by the arrow 11 in Figure 1.

The boot or sleeve 10 includes a main body portion 12 which is of somewhat tapered form as can be seen from Figure 2 to facilitate fitment of the boot or sleeve 10 snugly over the latch body so that the material of the boot or sleeve 10 will tend to cling to the latch body and grip it resiliently. The electric motor for effecting electric locking and unlocking of the latch is contained within the main body portion 12.

A wedge-shaped portion 13 projects from the main body portion 12 of the boot or sleeve 10 and this portion 13 is formed with horizontally extending slots 14 through which the latch levers project so that the appropriate linkages can be connected to the latch levers in the conventional manner. The lengths of the slots 14 are just sufficient to accommodate

the pivotal movements of the latch levers without any danger of rupturing the plastic material at the ends of the slots 14.

The slots 14 may be produced by appropriate shaping of the inner surface of the boot or sleeve 10. Thus the slots 14 may be bounded internally by surfaces inclined at angles of  $45^{\circ}$  to the plane in which each slot 14 is disposed. In order to reduce the possibility of rupturing of the plastics material at the ends of the slots 14, thickening ribs (not shown) may be provided at the ends of the slots 14.

The face 15 of the boot or sleeve 10 which faces inwardly of the door is formed with a somewhat conical projecting formation 16 which fits over a cable nipple projecting from the latch body. As can be seen from Figure 1, the conical portion of the formation 16 terminates in a cylindrical portion 17 the diameter of which is such that, when the formation 16 is fitted over the cable nipple projecting from the latch body, the portion 17 exerts a tight resilient grip on the corresponding portion of the cable nipple to prevent the entry of water into the interior of the boot or sleeve 10.

The boot or sleeve 10 is conformed to the exterior of the latch body so as to exert a close, resilient grip over substantially the whole of the outer surface of the latch body. The boot or sleeve 10 is open as indicated at 11 which corresponds to the shut face of the latch and a slot or channel

(not shown in Figures 1 and 2) is formed in each of two adjacent walls of the main body portion 12 of the boot or sleeve to allow entry of the latch striker for engagement with the latch bolt or claw.

Figures 3 to 5 show a boot or sleeve 20 for fitment to a latch which is somewhat larger than the latch to which the boot or sleeve 10 of Figures 1 and 2 is fitted, this latch being generally as described in co-pending Application No. 2 226 076, but with the addition of an electric motor for effecting locking and unlocking of the latch. The boot or sleeve 20 has an opening 21 corresponding to the shut face of the latch, a main body portion 22 and a wedge-shaped extension 23 which is formed with slots 24 and 25 to receive the latch levers. The slots 24 and 25 may be formed in the same way as the slots 14 mentioned above. The part of the boot or sleeve 20 remote from the opening 21 includes an enlargement 26 within which is housed the bell-crank lever system for effecting operation of the latch by means of a Bowden cable interconnecting the latch and the associated inside door handle.

A generally conical formation 27 which terminates in a cylindrical portion 28 extends from the enlargement 26 and is designed, in the manner described above in relation to the embodiment of Figures 1 and 2, to fit over a cable nipple on the latch body. The general purpose and mode of operation of

the sleeve 20 of Figures 3 to 5 is basically as described above.

An important advantage of both specific embodiments described above is that, not only do they provide a water-shield that can readily and effectively be fitted to a latch, but they also provide a significant sound-damping effect, the soft, flexible, plastics material of which the boots or sleeves 10, 20 are formed having significant sound-absorbing and hence sound-damping characteristics.

Each of the boots or sleeves 10, 20 is formed with a number of apertures to receive threaded fasteners for fixing the latch housing to the associated door panel in, for example, the manner described below with reference to Figure 10.

Turning next to Figures 6 to 9, these show a typical electrically operated vehicle door latch to which the boot or sleeve 10 of Figures 1 and 2 can be fitted. The latch includes a claw or bolt 30 pivotally mounted within a housing 31 that includes a plastics moulding shaped to define an open mouth (indicated at 32) which receives the latch striker and guides it into engagement with the claw or bolt 30. The portion of the boot or sleeve adjacent this open mouth 32 is formed with a correspondingly shaped channel or opening the boundary 33 of which is shown cross-hatched in Figure 6 which also shows the latch levers 34 and 35 for which correspondingly positioned

slots are formed in the boot or sleeve 10. The wall of the boot or sleeve at right angles to the plane of Figure 6 will also be formed with a cut-out or channel to permit passage of the striker into engagement with the claw 30 which is mounted on a base plate forming part of the latch housing 31.

If the latch of Figure 6 is a front driver's door latch, the latch housing 31 may carry an ajar switch which is operated when the vehicle door is open, the ajar switch assembly 36 being positioned as shown. The boot or sleeve 10 then includes a portion 37 which, as shown in Figure 9, contains vertical and horizontal slits 38 and 39. The slits 38 and 39 define flaps which, when the boot or sleeve 10 is fitted to a latch provided with an ajar switch assembly 36, open outwardly to either side of the switch assembly 36 to permit it to operate.

When, however, the boot or sleeve 10 is fitted to a latch not provided with an ajar switch assembly 36, the flaps of portion 37 will tend to remain co-planar with the remainder of said portion 37. The same boot or sleeve 10 can, therefore, be used regardless of whether or not the latch is provided with an ajar switch assembly 36.

Figure 8 shows, in outline only, the position which will be occupied by a typical electric motor actuator for the latch, that part 40 of the boot or sleeve 10 which fits over the motor being shown cross-hatched in this figure.

Turning next to Figure 10, this shows a portion 41 of the boot or sleeve 10 sandwiched between the latch housing 31 and the adjacent part 42 of the vehicle door panel. The portion 41 of the boot or sleeve 10 is provided with an insert which may be in the form of a washer 43 (as shown) but could be a clinch nut. The use of an insert at each position at which the latch housing 31 is attached to the door panel ensures that the latch housing can be secured in position without damaging the boot or sleeve and without significantly reducing the sound-damping action of the boot or sleeve 10.

Turning finally to Figure 11, this shows a part 50 of the housing of a vehicle door latch similar to that described in European Patent Specification No. 0169644, the latch being connected to the inside door handle by a Bowden cable mechanism the outer sheath 51 of which is anchored to the part 50 of the latch housing by means of a moulded plastic end formation 52. The latch has an electric motor (not shown) for effecting locking and unlocking of the latch. The latch, apart from the shut face thereof, is encased within a one-piece moulded boot or sleeve corresponding to the boots or sleeves 10, 20 described above. The boot or sleeve acts as a water-shield for the electric motor.

A part 53 of the water-shield is shown in Figure 11. As can be seen, the end formation 52 of the Bowden cable outer sheath 51 has an end flange 54 which, on assembly, is passed

through an opening in the part 50 of the latch housing, the flange 54 bounding one end of a first bearing surface 55. The axial length and the diameter of this first bearing surface 55 are such that the first bearing surface is a close fit in the opening in housing part 50.

The other end of the first bearing surface 55 is bounded by a first rib or shoulder 56 which is of the same diameter as the end flange 54 and of substantially the same thickness or axial length as the end flange 54. This first rib or shoulder 56 is spaced from a second rib or shoulder 57 which is again of the same diameter as the end flange 54 and of substantially the same thickness or axial length as the end flange 54. A second cylindrical bearing surface 58 is disposed between the first and second ribs or shoulders 56 and 57.

This second cylindrical bearing surface 58 is of greater diameter and of greater axial length than the first cylindrical bearing surface 55. Bearing surface 58 is a close fit within the aperture in part 53 of the water-shield, the engagement of the surfaces of the ribs or shoulders 56 and 57 with the surfaces of the part 53 being such that a grip is exerted by the ribs or shoulders 56 and 57 on the part 53.

The end formation 52 includes a part 59 which is of tapered form as shown and the method of assembly of the latch is such that the cable 60 is attached to the latch locking and

release levers in the manner illustrated in European Patent Specification No. 0169644, the first bearing surface 55 being engaged in a slot in the housing part 50 and the end flange 54 moved into the position shown. The latch and cable are then supplied to the vehicle assembly line prior to connection of the inside door handle and prior to fitment of the protective boot or sleeve.

On the vehicle assembly line, the end of the cable remote from the latch is passed through the opening in the part 53 of the water-shield and the water-shield is slid along the full length of the cable 60. At the end of the travel of the water-shield, and after it has been fitted around the latch so as to envelope the latch, apart from the latch shut face, the tapered part 59 of the end formation 52 and the second rib or shoulder 57 are passed through the opening in the part 53 of the water-shield.

The small difference between the external diameter of the second bearing surface 58, i.e. of the opening in the water-shield, and the external diameter of the rib or shoulder 57 minimises the degree of distortion of the polyvinylchloride water-shield during fitment thereof to the latch. The distortion which is effected is purely elastic deformation, as opposed to plastic deformation, and does not cause any permanent change in the configuration of the water-shield. The

small degree of distortion also minimises the danger of rupturing the polyvinylchloride during the assembly operation.

An extremely effective seal is thus obtained ensuring that, if water should drip down the cable, which can quite readily occur, the water dripping down the cable will be prevented by the water-shield from gaining access to the electric motor. Corrosion and consequent malfunction of the electric motor is thus prevented.

CLAIMS:

1. A vehicle door latch having a shut face and including locking and release levers, wherein the latch as a whole, apart from the shut face thereof, is encased within a boot or sleeve formed as a one-piece moulding of a water-impervious, sound-damping synthetic plastics material, which boot or sleeve is slotted or otherwise apertured to provide access for connection of a cable and to allow the locking and release levers to project so that linkages can be connected to the levers.

2. A vehicle door latch according to Claim 1, in which the cable is a Bowden cable.

3. A vehicle door latch according to Claim 1, in which the cable is an electric cable for the supply of actuating current to an electric actuator.

4. A vehicle door latch according to Claim 1, in which the boot or sleeve includes a main body portion and a projecting portion which is slotted to receive the latch levers.

5. A vehicle door latch according to Claim 4, in which the end of the boot or sleeve remote from the latch shut face is provided with an enlargement within which is located a bell crank mechanism.

6. A vehicle door latch according to Claim 1, in which the boot or sleeve is provided with a plurality of inserts which act as reinforcement elements around openings in the boot or sleeve through which pass the shanks of fixing elements used for attaching the latch housing to the vehicle door panel.

7. A vehicle door latch according to Claim 6, in which each of the reinforcement elements is a washer.

8. A vehicle door latch according to Claim 1, in which the latch includes a base plate formed with an open mouth to receive the latch striker for engagement with the latch bolt and in which the walls of the boot or sleeve are formed with channels to permit free movement of the striker into engagement with the latch bolt.

9. A vehicle door latch according to Claim 8, in which a part of the boot or sleeve is sandwiched between the base plate and an adjacent part of the vehicle door panel, which part of the boot or sleeve is provided with a plurality of openings for the shanks of fixing elements.

10. A vehicle door latch according to any one of the preceding claims, in which the boot or sleeve is formed of polyvinylchloride containing a high proportion of a plasticiser.

11. A vehicle door latch according to Claim 8, in which the boot or sleeve is formed with an extended aperture in the form of a vertical slit with horizontal slits at the ends of the vertical slit, said extended aperture providing accommodation for an afar switch.

12. A vehicle door latch according to Claim 2, in which the outer sheath of the Bowden cable is attached to the latch housing by an end formation which has a pair of spaced cylindrical bearing surfaces separated by a shoulder, said spaced cylindrical bearing surfaces comprising a first bearing

surface which fits within an opening in the latch housing to anchor said end formation and a second bearing surface which fits within the aperture in the boot or sleeve and has a diameter greater than that of the first bearing surface.

13. A vehicle door latch according to Claim 12, in which the end formation of the outer sheath of the Bowden cable is provided with an end flange and with two ribs or shoulders of the same diameter as the end flange.

14. A vehicle door latch according to Claim 13, in which the first bearing surface is located between the end flange and the first of the two ribs or shoulders while the second bearing surface, which has an axial length equal to the thickness of the adjacent portion of the boot or sleeve, is located between the two ribs or shoulders.

15. A water-shield for a vehicle door latch in the form of a one-piece moulding of a water-impervious, sound-damping synthetic plastics material, substantially as hereinbefore described with reference to and as shown in Figures 1 and 2, or Figures 3 to 5, or Figures 6 to 10, or Figure 11 of the accompanying drawings.

16. A motor vehicle door latch having a water-shield as claimed in Claim 15.

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